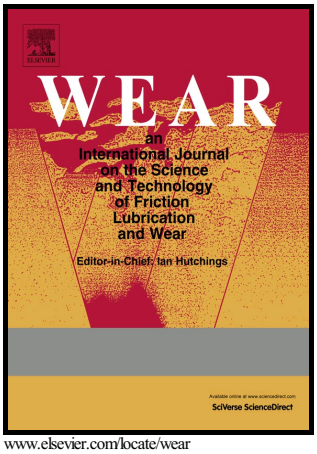

www.elsevier.com/locate/wear

Tribological performance of laser-patterned chain links – Influence of pattern geometry and periodicity

Andreas Rosenkranz, Frederik Krupp, Leander Reinert, Frank Mücklich, Bernd Sauer

PII: S0043-1648(16)30632-9
DOI: http://dx.doi.org/10.1016/j.wear.2016.11.006
Reference: WEA101819

To appear in: *Wear*

Received date: 25 August 2016
Revised date: 10 November 2016
Accepted date: 11 November 2016

Cite this article as: Andreas Rosenkranz, Frederik Krupp, Leander Reinert, Franl Mücklich and Bernd Sauer, Tribological performance of laser-patterned chai links – Influence of pattern geometry and periodicity, *Wear* http://dx.doi.org/10.1016/j.wear.2016.11.006

Tribological performance of laser-patterned chain links – Influence of pattern geometry and periodicity

Andreas Rosenkranz[1], Frederik Krupp[2*], Leander Reinert[1], Frank Mücklich[1], Bernd Sauer[2]

[1]Institute of Functional Materials, Saarland University, Department of Materials Science and Engineering, Campus D33, 66123 Saarbruecken, Germany
[2]Institute of Machine Elements, Gears, and Transmissions (MEGT), University of Kaiserslautern, Gottlieb-Daimler-Straße 42, 67663 Kaiserslautern, Germany

[*]Corresponding author. Tel.: +49 631 205 5425 Fax: +49 681 205 3716
frederik.krupp@mv.uni-kl.de

Abstract

In this work, we study friction and wear of laser-patterned chain links (42CrMo4 steel) using a specially modified ball-on-disk tribometer under linear reciprocating sliding (normal load of 15 N and sliding velocity of 3 cm/s). The results of the laser-patterned surfaces are compared to the behaviour of polished and serial chain links. Direct laser interference patterning (wavelength of 355 nm and pulse duration of 10 ns) was used to produce homogeneous line- or cross-like patterns with periodicities of 7 and 15 µm as well as a depth of roughly 1 µm. Light microscopy and white light interferometry was utilized to carefully analyse these surfaces and the resulting wear tracks. It could be shown that line-like surface patterns induce a detrimental behaviour regarding the resulting coefficient of friction, whereas cross-like patterns appear to be beneficial in terms of friction and wear reduction. This can be explained by the existence of closed lubrication pockets, which provide a secondary oil effect and build-up an additional hydrodynamic pressure. Furthermore, the findings observed in this work allow for a better understanding of the tribological performance of the serial chain link, mainly induced by a good load-bearing capability.